Doc Code:

PTO/SB/21 (09-04)
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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission	16

Application Number	09/761,264
Filing Date	1/16/2001
First Named Inventor	Michael E. Tompkins
Art Unit	2157
Examiner Name	Moustafa M. Meky
Attorney Docket Number	BALIN-56314

ENCLOSURES *(Check all that apply)*

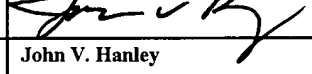
- [X] Fee Transmittal Form
- [X] Fee Attached
- [ ] Amendment / Reply
- [ ] After Final
- [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
- [ ] Reply to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) _____
- [ ] Landscape Table on CD
- [ ] After Allowance Communication to TC
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [X] Other Enclosure(s) (please identify below):

Postcard; Certificate of Correction w/ Exhibits

Remarks

CUSTOMER NO. 24201

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	FULWIDER PATTON LLP		
Signature			
Printed name	John V. Hanley		
Date	June 8, 2006	Reg. No.	38,171

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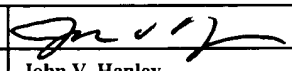
I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria,VA 22313-1450 on the date shown below:

Signature			
Typed or printed name	John V. Hanley	Date	June 8, 2006

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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OIPE IAP86 JUN 12 2006 PATENT & TRADEMARK OFFICE

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Fees pursuant to the Consolidated Appropriatons Act, 2005 (H.R. 4818).

FEE TRANSMITTAL for FY 2006

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) $100.00

Complete if Known	
Application Number	09/761,264
Filing Date	1/16/2001
First Named Inventor	Michael E. Tompkins
Examiner Name	Moustafa M. Meky
Art Unit	2157
Attorney Docket No.	BALIN-56314

METHOD OF PAYMENT (check all that apply)

☒ Check ☐ Credit Card ☐ Money Order ☐ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 06-2425 Deposit Account Name: Fulwider Patton LLP

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, except for the filing fee

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FEE CALCULATION (All the fees below are due upon filing or may be subject to a surcharge.)

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fees Paid($)
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 (including Reissues)	50	25
Each independent claim over 3 (including Reissues)	200	100
Multiple dependent claims	360	180

Total Claims		Extra Claims		Fee ($)		Fee Paid ($)
_____	- 20 or HP =	_____	x	$50.00	=	$0.00

HP = highest number of total claims paid for, if greater than 20.

Indep. Claims		Extra Claims		Fee ($)		Fee Paid ($)
_____	- 3 or HP =	_____	x	$200.00	=	$0.00

HP = highest number of independent claims paid for, if greater than 3.

Multiple Dependent Claims	
Fee ($)	Fee Paid ($)
_____	_____

3. APPLICATION SIZE FEE

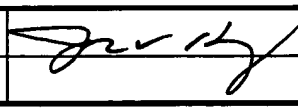
If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listing under 37 CFR 1.52(e)), the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets		Extra Sheets		Number of each additional 50 or fraction thereof		Fee ($)		Fee Paid ($)
_____	- 100 =	0	/ 50	0	(round **up** to a whole number) x	$250.00	=	$0.00

4. OTHER FEE(S)

	Fee Paid ($)
Non-English specification, $130 fee (no small entity discount)	
Other (e.g., late filing surcharge): Certificate of Correction	$100.00

SUBMITTED BY

Signature		Registration No. (Attorney/Agent)	38,171	Telephone	310-824-5555
Name (Print/Type)	John V. Hanley			Date	June 8, 2006

This collection of information is required by 37 CFR 1.136. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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cofC

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of	Examiner: Moustafa M. Meky
MICHAEL E. TOMPKINS ET AL.	Group Art Unit: 2157
Patent No.: 6,976,052 B2	Client ID/Matter No: BALIN 56314
Issued: December 13, 2005	
Serial No: 09/761,264	
Filed: January 16, 2001	June 8, 2006 Los Angeles, California 90045
For: SPA CONTROL SYSTEM	

REQUEST FOR CERTIFICATE OF CORRECTION

Certificate of Correction Department
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Certificate
JUN 14 2006
of Correction

Dear Sir:

The above-identified patent has been found to have the errors set forth in the enclosed Certificate of Correction. It is requested that this Certificate of Correction be issued and returned to us. Since these errors occurred in the final printing phase of the patent and in the final application, a check in the amount of $100.00 is enclosed to cover the necessary fees. Should the Office determine that additional fees are needed, please charge Deposit Account No. 06-2425.

06/13/2006 NNGUYEN1 00000063 6976052
01 FC:1811 100.00 OP

The errors are verifiable in the patent application file as follows:

ERROR	APPLICATION FILE
Title page, drawing should be deleted to appear as per the attached Fig. 1.	Applicant error.
The sheets of drawings consisting of figures 1-13 should be deleted as per attached figures 1-13.	Applicant error.
Page 3, OTHER PUBLICATIONS, delete "Photgraph of an ACC SC-200 circuit board." and insert -- Photograph of an ACC SC-200 circuit board.--;	Information Disclosure Statement dated September 6, 2003. See Attachment A.
Page 3, OTHER PUBLICATIONS, delete "Siege's Supplemental memorandum of Law on the Construction of Claims 1 and 37" and insert --Siege's Supplemental Memorandum of Law on the Construction of Claims 1 and 37--.	Applicant error.
Column 1, line 62, delete "away from the sap" and insert --away from the spa--.	Applicant error.
Column 2, line 12, delete "start" and insert --start--.	Patent Application filed on January 16, 2001, page 3, line 8. See Attachment B.
Column 5, line 1, delete "the signals" and insert --the low signals--.	Supplemental After Final Amendment dated November 5, 2004, page 5. See Attachment C.
Column 5, line 14, delete "6f" and insert --of--.	Supplemental After Final Amendment dated November 5, 2004, page 5. See Attachment C.
Column 6, line 67, after "base" delete "be".	Applicant error.

ERROR	APPLICATION FILE
Column 7, line 40, delete "4Q" and insert --**40**--.	Supplemental After Final Amendment dated November 5, 2004, page 7. See Attachment C.
Column 8, line 28, delete "fo" and insert --of--.	Applicant error.
Column 8, line 43, delete "the turn" and insert --then turn--.	Patent Application filed on January 16, 2001, page 19, line 1. See Attachment B.
Column 8, line 52, delete "TEMPERTURE" and insert --TEMPERATURE--.	Patent Application filed on January 16, 2001, page 19, line 7. See Attachment B.
Column 9, line 3, delete "(pH input" and insert --(pH input)--.	Patent Application filed on January 16, 2001, page 20, line 1. See Attachment B.
Column 9, line 35, delete "CALn." and insert --CALn--.	Patent Application filed on January 16, 2001, page 21, line 7. See Attachment B.
Column 9, line 55, delete "setting" and insert --setting.--.	Patent Application filed on January 16, 2001, page 22, line 3. See Attachment B.
Column 9, line 66, delete "Ln:xx" and insert --Hn:xx--.	Patent Application filed on January 16, 2001, page 22, line 11. See Attachment B.
Column 10, line 18, delete "th" and insert --the--.	Patent Application filed on January 16, 2001, page 23, line 6. See Attachment B.
Column 10, line 21, delete "use" and insert --user--.	Patent Application filed on January 16, 2001, page 23, line 8. See Attachment B.
Column 10, line 34, delete "Hn:Er" and insert --PH:Er--.	Patent Application filed on January 16, 2001, page 23, line 16. See Attachment B.

ERROR	APPLICATION FILE
Column 10, line 37, delete "he" and insert --the--.	Patent Application filed on January 16, 2001, page 23, line 18. See Attachment B.
Column 10, line 41, delete "marches" and insert --matches--.	Patent Application filed on January 16, 2001, page 23, line 21. See Attachment B.
Column 10, line 53, delete "if a" and insert --if the--.	Patent Application filed on January 16, 2001, page 24, line 10. See Attachment B.
Column 11, line 47, delete "is maintenance mode" and insert --is in maintenance mode--.	Applicant error.
Column 11, line 53, delete "re" and insert --are--.	Applicant error.
Column 12, line 9, delete "fog" and insert --from--.	Patent Application filed on January 16, 2001, page 27, line 17. See Attachment B.
Column 12, line 42, delete "a on/off" and insert --an on/off--.	Applicant error.
Column 12, line 43, delete "hey" and insert --they--.	Patent Application filed on January 16, 2001, page 28, line 20. See Attachment B.
Column 13, line 18, delete "or" and insert --for--.	Patent Application filed on January 16, 2001, page 30, line 12. See Attachment B.
Column 13, line 22, delete "dressed" and insert --pressed--.	Patent Application filed on January 16, 2001, page 30, line 16. See Attachment B.
Column 16, line 4, delete "Present" and insert --present--.	Supplemental After Final Amendment dated November 5, 2004, page 11. See Attachment C.

ERROR	APPLICATION FILE
Column 17, line 12, delete "trough" and insert --through--.	Patent Application filed on January 16, 2001, page 38, line 15. See Attachment B.
Column 17, line 13, delete "lag" and insert --flag--.	Patent Application filed on January 16, 2001, page 38, line 16. See Attachment B.
Column 17, line 43, delete "Th&up" and insert --The up--.	Patent Application filed on January 16, 2001, page 39, line 19. See Attachment B.
Column 19, line 19, delete ",are" and insert --the--.	Patent Application filed on January 16, 2001, page 43, line 13. See Attachment B.
Column 19, line 41, delete "or" and insert --for--.	Patent Application filed on January 16, 2001, page 44, line 7. See Attachment B.
Column 19, line 52, delete "here" and insert --there--.	Patent Application filed on January 16, 2001, page 44, line 14. See Attachment B.
Column 19, line 55, delete "heaving" and insert --heating--.	Patent Application filed on January 16, 2001, page 44, line 16. See Attachment B.
Column 19, line 64, delete "ox" and insert --of--.	Patent Application filed on January 16, 2001, page 45, line 3. See Attachment B.
Column 20, line 2, delete "scheduler" and insert --scheduled--.	Patent Application filed on January 16, 2001, page 45, line 6. See Attachment B.
Column 20, line 7, delete "educe" and insert --reduce--.	Patent Application filed on January 16, 2001, page 45, line 9. See Attachment B.

ERROR	APPLICATION FILE
Column 20, line 38, delete "sa" and insert --spa--.	Patent Application filed on January 16, 2001, page 46, line 12. See Attachment B.
Column 20, line 38, after "unattended" insert --.-- (a period).	Patent Application filed on January 16, 2001, page 46, line 12. See Attachment B.
Column 21, line 26, delete "convening" and insert --converting--.	Response dated September 14, 2004, page 3. See Attachment D.
Column 22, line 7, delete "Interconnection" and insert -- interconnection--.	Applicant error.

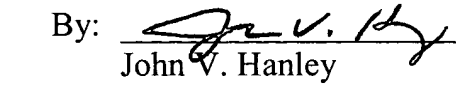
These errors occurred in good faith and correction thereof does not involve such changes in the patent as would constitute new matter or would require re-examination. It is requested that a Certificate of Correction be issued and returned to us.

Attached hereto, in duplicate, is Form PTO-1050, with at least one copy being suitable for printing.

A duplicate of this document is attached.

Respectfully submitted,

FULWIDER PATTON LLP

By: 

John V. Hanley
Registration No. 38,171

JVH:ck
Enclosures

Howard Hughes Center
6060 Center Drive, Tenth Floor

Los Angeles, CA 90045
Telephone: (310) 824-5555
Facsimile: (310) 824-9696
Customer No. 24201

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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 10 of 20

Complete if Known	
Application Number	09/761,264
Filing Date	January 16, 2001
First Named Inventor	Michael E. Tompkins
Group Art Unit	2157
Examiner Name	Mehta
Attorney Docket Number	BALIN-56314

OTHER PRIOR ART - NON PATENT LITERATURE DOCUMENTS			
Examiner Initials	Cite No.	Title of Article	
		Motorola Microprocessor, Microcontroller, and Peripheral Data, Vol. 1, 1988	
		Newspaper article: Mary Kay Seff, "Bathrooms are getting pretty splashy," San Diego Union Tribune, May 9, 1986	
		Newsweek article: Givens and Springen, "Splish, splash, it's more than a bath," May 5, 1986	
		Newspaper article: Teresa Foreman, "Pieces of Yesterday Graced with Touches of Tomorrow," The Record, May 4, 1986.	
		Newspaper article: "Spring Home '86; Shorts and fillers," UPI, BC Cycle, March 27, 1986.	
		Newspaper article: "Dial a dub dub," The Financial Post (Toronto), March 22, 1986.	
		Newspaper article: Frederika Randall, "Designers put the bathroom in its place high tech makes it a nice place to visit," Chicago Tribune, March 9, 1986.	
		Newspaper article: Frederika Randall, "Baths of the future at a fair in Milan," New York Times, February 13, 1986.	
		Agreement between Siege Industries, Inc. and ICS Development, Inc., dated March 23, 1987.	
		Jury instructions and questions, Siege Industries, Inc. v. Clark Mfg, Inc., et al.	
		Advertising for Applied Computer Controls SC 100 spa controller.	
		Advertising for ACC Spa controller products with photos of a SP-200 skid pack, etc.	
		Photograph of an ACC SC-200 circuit board	
		Photograph of SC-200 spa control board connected to control panel and thermistor.	
		Photograph of SC-200 control panel.	
		Software code for SC-200 spa control board	

M. Mehta

9-6-2003

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JUN 12 2006
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is not adversely affected by the corrosive environment surrounding the spa. The spa temperature control system generally comprises a heating element, a sensor for detecting the temperature of the water, and a microcomputer for processing signals generated by said sensor and for activating and deactivating the heating element. In one embodiment of the invention, the microcomputer assesses the time necessary to heat water from an initial temperature to a selected temperature. From this information, the heating rate of the water can be calculated. The heating rate can be stored by the microcomputer and can be used to determine the start time necessary to heat the spa water from an initial temperature to a selected temperature by a desired time. In the same or another embodiment of the invention, the temperature difference between two sensors in the spa system can be monitored to detect problems in the system.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 illustrates a schematic block drawing of the spa control system.

FIGURE 2 illustrates a block diagram of the microcomputer and its associated components.

FIGURE 3 illustrates a block diagram of the spa control system field innerconnection panel.

FIGURE 4 illustrates a functional block diagram of the software which operates the spa control system through the microcomputer.

FIGURE 5 illustrates one embodiment of a display panel for the operation of the spa control system.

then turn all LEDs and segments off. The following is a map of the keys and the values displayed in maintenance mode:

SCHEDULED HEAT	pH input
SPA READY	spa temperature input
FILTER	heater temperature input
TIME	overtemp time accumulator
TEMPERATURE	heater run accumulator
JET	pump run accumulator
TURBO	turbo run accumulator

Accumulated time values are displayed in thousands of hours. A decimal point is placed to autorange the displayed value.

System calibrations are accessed by pressing the light key while in maintenance mode. When the light key is pressed, a series of options are displayed. To select a step, or continue it, an arrow key is pressed. To get the next selection or return to the "test" display, the light key is pressed. The options available are:

CAL0	Calibrate analog channel 0 (spa temperature). This is a two point (32 and 104 degree) calibration for offset and gain correction.
CAL1	Calibrate analog channel 1 (heater temperature). This is identical to CAL0.

CAL2 Calibrate analog channel 2 (pH input). This is a one point (0 volts) calibration for offset correction.

CPU Display cpu RAM contents.

nov Display NOVRAM contents.

rvx.y The software revision is "x.y"

The following describes the modules that make up the system controller and further describes the algorithms they contain:

The module anlgin-routine anlgin routine controls the input of a specified analog input channel. The operations it performs are:

* output channel number
* read input value

The module BCDNEG routine is called to negate a BCD value.

The module BINBCD routine is called to convert a binary value to a BCD value.

The buzzkey routine is called to determine if the key closure should result in the buzzer beeping. "Positive" key values result in the buzzer flag being set for "buzzer".

The buzzer routine is called to drive the buzzer if a key was pressed. The buzzer interval is decremented until it is zero and the buzzer stops.

The buzzoff routine is called to cancel the keyboard buzzer output in special cases when the state handler wishes to block certain keys from being acknowledged.

The KBCAL0 routine is called to handle keyboard inputs while displaying "CAL0". It allows the user to move on to CAL1 or to select to calibrate analog channel 0.

The KBCAL1 routine is called to handle keyboard inputs while displaying "CAL1". It allows the user to move on to CAL2 or to select to calibrate analog channel 1.

The DSPCAL0, DSPCAL1, DSPCPH routines display the "CALn" message.

The KBCLOW routine handles keyboard inputs while scanning the low (32 degree) value during calibration or channels 0 and 1. The user can select to abort or continue. If the choice is to continue and the raw input value is in the range 1...31, then the value is accepted and calibration continues to the high step. Otherwise, the low error state is entered.

The DSPCLOW routine is called to display the raw value while waiting for the low (32 degree) input value. It builds a display of the form "Ln:xx" where n is 0 or 1 and xx is the ra input value.

The KBCLERR routine is called when the calibration is in the low error state. It allows the user to choose to abort or retry the input of the calibration value.

The DSPCLERR routine is called to display the low calibration error message of the form "Lx:Er" where x is 0 or 1.

The KBCHI routine is called to handle keyboard inputs while the temperature calibration is in the high (104 degree) input state. It allows the user to abort or accept the current setting. If the current setting is in the range 163...195, the value is accepted. In conjunction with the previously obtained low value, a pair of values, m and b, are calculated such that the raw value r, m*r+b will result in a corrected value at the two calibration points. These two values are stored in NOVRAM and used from this point onward in temperature calculations for this channel. The system then proceeds to the "done" state. If the input value is not in the correct range, the system proceeds to the high error state.

The DSPCHI routine is called to display the raw input while in the high (104 degree) calibration step. It builds a message of the form "Hn:xx" where n is 0 or 1 and xx is the raw value.

The KBCHERR routine is called when the calibration is in the high error state. It handles the keyboard input and allows the user to abort the sequence or return to the high value input sate.

The DSPCHERR routine is called to display the message "Hn:Er" when the high calibration step is in error. "n" is either 0 or 1.

The KBCDONE routine is called to handle keyboard inputs when the calibration is complete. It allows the user to return to the idle maintenance mode state. It acts to hold the "done" message until the user acknowledges it.

The DSPCDONE routine is called when the calibration has reached a successful conclusion. It displays the message "done".

GETRAW is a routine local to the calibration module to fetch the appropriate raw input from the raw input table.

The KBCPH routine is called when "CAL2" is displayed. It allows the user to choose to move to the next item in the "light" menu or to calibrate the pH input.

The KBCPHI routine is called to handle keyboard inputs when calibrating the pH input. It allows the user to abort the operation, or to accept the current input. If the current input has an error of less than 32, the offset is stored and the calibration goes to the "done" state. If the error is too large, the system goes into the pH error state.

The DSPCPI routine is called to display the current raw pH input during pH calibration. It forms a message of the form "PH:xx" where xx is the current raw input.

The KBCPHE routine is called to handle keyboard inputs when the pH calibration value has too large an error. It allows the user to abort the operation or to retry the calibration.

The DSPCPE routine is called to display the error message "PH:Er" when the calibration value has too large of an error.

The module control-routine CTLPOLL routine is called by the main program to perform the actual output controls. The following tasks are performed:

Set Ready - if the set ready function is enabled, this section decides if the set ready function is to perform any actions. If the current time matches the ready time,

the set ready temperature is copied to the spa temperature setpoint, the spa is marked "attended" and the set ready function is disabled to prevent further actions.

For the Set Ready, as well as for Normal Temperature Control discussed infra, the time required to get from the current temperature to the desired temperature is calculated and with a fifteen minute hysteresis, the decision is made whether to turn the function on, or to turn it off. If the function is to be on, a request is posted to the heater to run.

System Attended - system attendance is checked and if the system is unattended, the high speed jet and the turbo controls are turned off. The system is marked attended if the key has been pressed within the last 30 minutes.

Scheduled Heating - if the scheduled heating function is enabled, this section decides if this feature should perform any actions. If the system is attended, control is passed to the next section, normal setpoint control. If the function is off, the temperature is compared to the low setting and the time is compared to the time setting. If appropriate, the function is requested, but control is still passed to the "on" section to allow it to override the time startup. If the function is on, the temperature is compared to the high setting and turned off if the setting has been reached. The next section, normal setpoint control, is then skipped.

Normal Temperature Control - this function is executed if the system is attended or if the scheduled heating function is not enabled. It compares the current

LED is driven steadily if the heater is on and flashed if the heater is off and has a request posted. The filter, set ready, scheduled heat and temperature LEDS are flashed if the corresponding function is posting a request and if the operator is not in a state used to set the function. If the operator is setting the function, the LED is already on and is not flashed.

The Module Delay-Routine Delay routine provides a software waitloop style of delay routine used mainly during powerup.

The Module DELTIME-Routines ADELTIME DELTIME routines are used to determine the interval between the current time and the specified time. DELTIME determines the time that has elapsed since the specified time while ADELTIME determines the time that remains until the specified time arrives.

The Display module contains routines that convert values into displayable messages and a routine that actually writes the messages to the display. Many of the routines have two entry points, DSPxxx and BFRxxx. The DSP version uses the standard buffer while the BFR version uses a user-specified buffer. The DSP version only will be described to avoid repetitive descriptions of the BFR versions.

The DSPULZ routine is called to remove leading zeros from numeric messages.

The DSPBCD routine is called to convert from a BCD value to a display image.

The DSPOUT routine sends the message image to the display.

The DSPTIM routine converts a time value into a message.

The DSPTMP routine converts a temperature value into a message.

The DSPERR routine converts an error number into an error message.

The DSPPH routine converts a pH value into a message image.

The EXTRAM module contains routines to support the NOVRAM image of the system configuration.

The NVSUM routine is used to calculate the checksum value. It is used by the other routines to handle the checksummed configuration record.

The NVUPDT routine is called whenever a change is made to the configuration. It updates the checksum value. Powerfail interrupts are masked until the new checksum has been completed.

The ERTEST routine is called at powerup time to verify the system configuration. If the image is corrupted, it is reset to reasonable fallback values.

The Filter module contains routines that allow the user to set the filter maintenance interval. It has already been described in the operator settings sections.

The Flash module contains routines that support a consistent 2 hertz flash of LEDS, display, etc.

The Flashdrive routine is called to drive the timebase for the flasher. It is called once per timer interrupt synch by the main program.

The Flash routine returns a on/off flag to allow callers to determine if they should be setting or clearing their outputs to flash.

The SHOPH routine is called to display the pH value. If no pH probe is installed, control is passed to the error displayer. Like the temperature display, the refresh flag is used to avoid flickering displays. When the timer expires, the error display state is called.

The ERRIDLE routine is called to display the errors. If no errors remain, the display time state is entered. If another error exists to be displayed, the value is displayed and the timer is restarted.

The Keyboard module contains routines that support the keyboard inputs. Keyboard inputs are signaled when the key is pressed. Key inputs are represented by an array of bits that are set when a positive transition has been detected. Three keys (up, down and maintenance) provide bits that correspond to the release of the keys. The up and down keys provide for an autorepeat that starts after a half a second and repeat at a frequency of approximately three hertz. Key transitions in both directions (on and off) are debounced.

The KBINT routine is called to initialize the keyboard image. It sets up the image such that keys that are pressed while the system powers up are ignored. Thus, a jammed key will not activate its corresponding function when the system started.

The KBSCAN routine is called periodically by the timer interrupt handler to scan the keyboard inputs and update the keyboard input image. Transitions are accumulated until they are cleared by a separate routine. Rollover is handled as additive keys. Simultaneous keys are allowed and are handled by the individual state handlers

arrow button 55 or the down arrow button 63 can be used to increase or decrease the temperature setting as desired. When the desired value is shown on the display 46, the set temperature button 65 is depressed and the system will revert to the normal scroll in display. The ranges on the temperature setting may range from 40 to 104 degrees Fahrenheit.

Referring to Figure 6, when the system is powered up, the system is reset 100 by system initialization 102 which enables certain events and parameters and then calls the main program 100. Certain interrupts such as the timer interrupt 106 and the power fail interrupt 108 are enabled to detect future interrupts which can then be polled 100 or effect a system shutdown 112. The powerup reset 100 also generally clears all RAM 32, turns off control outputs for devices 24, 26, 28, 30, initializes the real time clock 34 reading and the keyboard scanner, tests the NOVRAM 32 image for validity, and tests EPROM memory 44 (See Figure 7).

On power-up sequence, the AC line input is read and the system electronics make a determination on whether the power is 110v or 220v. This status is read through a digital input by microcomputer 10 and an associated flag is set in RAM indicating which power supply is connected to the controller. On 100v, the following constraints are imposed by the software:

Heater and low speed pump will be turned off if either the high speed pump (jets) or the blower is turned on.

The heater LED will flash during this time indicating it is tryign to heat but has been overridden.

On 220v systems, no constraints are applied. The operation of this function is illustrated in Fig. 8.

The set ready button is used to preset the time and temperature that is desired by the user.

The microcomputer 10 calculates the proper time to initiate heating based on the present initial temperature of the water, and the stored data on the rate of heating for the particular spa. Each time that the spa is heated, the microcomputer 10 monitors the rate of change in the water temperature and stores this information in the internal memory. This data is then used to calculate the time necessary to heat the spa water from the initial temperature to the selected temperature.

To operate the set ready, or spa ready mode, the set ready button 50 is depressed and the set ready light 50 and the hours light digits on display 46 are illuminated. The hours are set by using the up button 55 and down button 63 arrows. When the hours are correct, the set ready button 50 is depressed and the minutes digits will flash. The minutes data are set by using the up button 55 and the down button 63 arrows. When the minutes data is correct, the set ready button 50 is depressed and the current thermostat setting is displayed. The up button 55 or down button 63 arrow is pressed to select the proper temperature. The set ready button 50 is then depressed again and "on" or "off" will flash on the display screen 46. This indicates whether the feature

is blockage in the system. The spa system accomplishes this by monitoring the temperatures detected by sensors located at selected locations in the spa control system. In one embodiment of the invention, a first sensor (now shown), which can be a solid state sensor, is located upstream of the heating element at a selected location and a second sensor (not shown) is located downstream of the heating element. As water flows over the heating element of heater 26, the sensors detect the temperature of the water at the selected locations. The microcomputer 10 processes the signals generated by the sensors and calculates the difference in temperature between the values detected by the sensors. The microprocessor selectively activates and deactivates the heating element of heater 26 to control the rate of heating. If the difference exceeds a selected amount, a warning on digital display 46, or other warning such as an audible sound, can be generated to warn the user of a malfunction in the spa. This function of the invention is shown in Figure 7.

In one embodiment of the system, two temperature probes are monitored constantly for temperature differences whenever the pump is in operation. When the pump is started, five minutes are allowed for the two readings to get within six degrees Fahrenheit of one another. If the probes fail to match after this period, all spa operations cease and an error message is displayed to the user. If the heater temperature is more than six degrees higher than the spa temperature, the heater is not turned on. If the heater temperature is more than six degrees colder than the spa temperature and the heater function is signaled to be on by other portions of the control program, the heater is turned on even though the temperatures do not match. If at any time after the first five minutes

the difference between the two temperature readings exceeds six degrees, all spa operations are disabled and an error message is displayed to the user.

As previously noted, this embodiment determines whether flow is present in the spa plumbing. If a blockage exists, it will result in a temperature difference which will cause the system to halt operations. The initial five minute period allows for the equalization of temperature differences that naturally occur when no water flow is present. Typically, a finite period of time is required for plumbing fixtures to warm and cool and for the temperature sensor to react to its surroundings.

In addition, the microcomputer 10 can calculate the rate of heating detected by either sensor to determine whether there may be fluid blockage in the spa system. This calculation can be performed by dividing the change in temperature by the change in time to compute the rate of heating. For example, if there is a fluid blockage in the system, the spa water surrounding the heating element of heater 26 may rapidly overheat to create a "hot spot" in the spa system. If the temperature of the water does not increase, there may be a malfunction in the heating element. If any error is detected which signifies that the spa system is not properly working, the microcomputer 10 can deactivate the heating element to prevent overheating of the components of the spa system or can signal an error code on the display. The rate of heating can also be monitored to ensure that scalding water is not unexpectedly circulated in contact with the spa user. A cumulative average rate of heating for the spa system can be calculated from the heating rates which are

calculated each time that the spa temperature is increased. This function of the invention is shown in Figure 9.

In one embodiment of the invention, the temperature of the water can be maintained within a selected temperature range or hysteresis when the spa is unattended, and the system can be programmed to heat the water temperature to a selected amount at a desired time. This function, referred to as the scheduled heating function, is begun by setting the start time and the high and low temperature limits. Next, the function is enabled. For example, the operator might select a lower temperature range, while the spa is unattended, to conserve energy. A lower temperature range would also reduce the number of times that the spa system would cycle on and off to maintain the desired temperature, if the lower water temperature is closer to the ambient temperature. Conversely, the operator can select a higher temperature range, closer to the desired temperature of the spa water, to minimize the time required to heat the spa water to the selected operating temperature. The ability to control the temperature of the water while the spa is unattended also yields other useful benefits. For example, the spa system can be programmed to heat the water to a desired temperature at a time of day when electrical power rates are minimal. The heat loss of the spa system during periods when the spa is unattended, calculated from the time that the spa water is heated to the desired temperature, can be calculated to maximize the operating efficiency of the entire spa system.

In another embodiment of the invention, the heating rate of the water can be monitored to calculate the estimated time necessary to raise the water temperature to a desired level, and to detect certain failures in the spa system. For example, a sudden increase in the water temperature at a specific point in the spa system may signal that there is a loss of water circulation. If a sensor detects a heating rate which exceeds a selected rate, a warning message may be displayed, or the heating element of heater 26 or the entire spa system may be deactivated to prevent deleterious heating of the spa components. As previously set forth, the rate of heating, together with the actual temperature reading and volume of water in the spa system, can be used to calculate the time required to heat the spa water to a desired temperature. This information can be stored in the microcomputer to assist in predicting the time necessary to heat the spa water to the desired temperature, beginning with the initial temperature of the water when the spa is unattended. This function is shown in Figure 10.

To further illustrate the spa control system and certain of its functions, Figure 11 shows a flowchart for one embodiment of the system which illustrates Power-up/Reset function, which describes how the system is initiated and can be modified by one operator; Figure 12 shows a flowchart for the Timer Interrupt function, which interrupts a programmed command; and Figure 13 shows a flowchart for the Powerfail function, which shuts down certain components of the system upon a certain event. As with other embodiments illustrated herein, the flowcharts shown in FIGS. 11-13 represent differing

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translates the analog information into digital information through, for example, dual slope integration which permits fast and accurate conversion. The accuracy of the A-D section 36 typically is 8 bits or a resolution of 1 out of 256. The signals from external probes and sensors 20, 21, 22 are conditioned by amplifying, filtering, or conditioning the signals 37 so that the A-D converter 36 can make an accurate conversion. The Signal Conditioning section 37 also receives the [[small]] low signals from external probes 20, 21, 22 and amplifies it to a level where the A-D converter 36 can make an accurate conversion. This section 37 also provides transient and surge protection to reduce normal and common mode rejection noise.

Please replace the paragraph on Page 10, line 14 with the following amended paragraph.

The keyboard monitor routine 82 scans the keyboard and is triggered by the operation of any key. The key signal from the digital input is then decoded, and the main program 80 is triggered to initiate a series of programmed events. The program ignores multiple key depressions and erroneous entries and operates only upon the signal generated from a proper key entry. The display control program 84 converts data from the EPROM 44 to readable messages which can be shown on the display [[46]]40. The display control 84 handles the timing of the signals so that the display [[46]]40 performs in an efficient and proper manner. The alarm control 86 monitors the proper operation of the entire spa system. If the system malfunctions or otherwise operates incorrectly as measured by the input signals or data inferred from the input signals, the alarm will signal the malfunction to the panel 12. Examples of malfunctions in the system that might occur are the malfunction of the heater 26 and whether the pH 22 levels are within an acceptable range. In the event of a malfunction, a signal will be sent to the display controller 84 to display the alert signal and to alert the spa user of the malfunction.

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Please replace the paragraph on Page 14, line 19 with the following amended paragraph.

The main program 104 performs the bulk of the operations performed by the system controller. It synchronizes with the timer interrupt so that a reasonably constant timebase be is used. A state machine is maintained to determine how keyboard inputs are to be interpreted and what is to be displayed. The following tasks are performed by the main program:

Please replace the paragraph on Page 15, line 19 with the following amended paragraph.

Operator settings can be controlled by keys on the system ~~keypad~~ keyboard which are used to select modes that allow the operator to change settings that control system operations. These are grouped at the right side of the ~~keypad~~ keyboard. They are:

Please replace the paragraph on Page 16, line 6 with the following amended paragraph.

All of these functions adhere to a consistent operator interface scheme. When the function key is pressed, the LED 52 next to the key 50 is lit. The LED remains lit until all steps have been completed or another function has been selected. While setting a value, the value is displayed on the screen 46 and is flashed. The arrow keys are used to change the displayed value and the function key is pressed to proceed to the next step in the setting. While changes are being made, the display 40 stops flashing to avoid changes occurring while the display is in the off state. Once changes have stopped, the display resumes flashing. Changes are honored as they are made and the operator can change one step of a function without affecting the remaining steps. The current setting can be reviewed by pressing the appropriate function key repeatably. When a function that has been defined by the operator is currently being executed, the LED next to the corresponding button blinks.

Please replace the paragraph on Page 35, line 18 with the following amended paragraph.

The Module Timer-Routine ~~Timer~~ is the timer interrupt handler. Its behavior has previously been described.

Please replace the paragraph on Page 36, line 1 with the following amended paragraph.

The Module ~~UNMIL-Routine~~ UNMIL routine converts from military twenty-four hour format (used internally) to twelve hour am/pm format (preferred by most users).

Please add the following paragraphs on Page 36, line 14.

Figure 14 shows one possible configuration of the system of the present invention based on the above description. A spa, in accordance with normal convention, includes a container 11 for holding water 13 for bathers. The control panel 12 may be at spa side. As has been previously described, various output devices are installed in the system for the user of the system. As is well known in the art, conventional output devices include a heater 26, an air blower 28, a filter 27, lights 30, and a pump 24. Pump 24 may be separate pumps or one pump with a high and low speed. Heater 26 includes a heating element or heater core 29 for heating the water. Plumbing is provided with the system such as a plurality of pipes 35 for flowing water to and from the container 11. The low speed of pump 24 pumps water through pipes 35 causing the water to pass through filter 27 and heater 26 prior to flowing into container 11. The high speed of pump 24 flows water at high speeds through jet 37 mounted on container 11. The turbo or air blower 28 blows air into the water 13.

Various input devices are installed at selected locations within the system of the present invention and include sensors for detecting various parameters of the water and the system. Such sensors include the flow rate sensor 18, the temperature sensor 20 measuring the temperature of the water at the heating element 29, the temperature sensor 21 measuring the temperature of the

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Claim 39 (previously presented): The spa control system of claim 35, wherein one of the electrical components is a heating element, and another of the electrical components is a pump.

Claim 40 (previously presented): The spa control system of claim 39, wherein the heating element is an electrical resistive heating element and operates to heat water held by the spa.

Claim 41 (previously presented): The spa control system of claim 35, the spa control system further comprising an electronic circuitry associated with the microcomputer and being capable of converting analog signals to engineering units expressed as alphanumeric characters.

Claim 42 (previously presented): The spa control system of claim 35, the spa control system further including at least one electronic solid state temperature sensor to measure the temperature of water of the spa, and a second electronic sensor to measure another parameter of water of the spa.

Claim 43 (previously presented): The spa control system of claim 42, wherein the temperature sensor produces an electronic signal proportional to the temperature of water in the spa, and the second sensor produces an electronic signal indicative of presence or absence of water flow.

Claim 44 (previously presented): The spa control system of claim 43, wherein the microcomputer converts the electronic signals proportional to temperature to engineering units using a curve fitting algorithm.

Claim 45 (previously presented): The spa control system of claim 44, wherein the microcomputer is capable of displaying the temperature in alphanumeric engineering units on the control panel.

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JUN 12 2006
PATENT & TRADEMARK OFFICE

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of

MICHAEL E. TOMPKINS ET AL.

Patent No.: 6,976,052 B2

Issued: December 13, 2005

Serial No: 09/761,264

Filed: January 16, 2001

For: SPA CONTROL SYSTEM

Examiner: Moustafa M. Meky

Group Art Unit: 2157

Client ID/Matter No: BALIN 56314

June 8, 2006
Los Angeles, California 90045

REQUEST FOR CERTIFICATE OF CORRECTION

Certificate of Correction Department
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

The above-identified patent has been found to have the errors set forth in the enclosed Certificate of Correction. It is requested that this Certificate of Correction be issued and returned to us. Since these errors occurred in the final printing phase of the patent and in the final application, a check in the amount of $100.00 is enclosed to cover the necessary fees. Should the Office determine that additional fees are needed, please charge Deposit Account No. 06-2425.

The errors are verifiable in the patent application file as follows:

ERROR	APPLICATION FILE
Title page, drawing should be deleted to appear as per the attached Fig. 1.	Applicant error.
The sheets of drawings consisting of figures 1-13 should be deleted as per attached figures 1-13.	Applicant error.
Page 3, OTHER PUBLICATIONS, delete "Photgraph of an ACC SC-200 circuit board." and insert -- Photograph of an ACC SC-200 circuit board.--;	Information Disclosure Statement dated September 6, 2003. See Attachment A.
Page 3, OTHER PUBLICATIONS, delete "Siege's Supplemental memorandum of Law on the Construction of Claims 1 and 37" and insert --Siege's Supplemental Memorandum of Law on the Construction of Claims 1 and 37--.	Applicant error.
Column 1, line 62, delete "away from the sap" and insert --away from the spa--.	Applicant error.
Column 2, line 12, delete "start" and insert --start--.	Patent Application filed on January 16, 2001, page 3, line 8. See Attachment B.
Column 5, line 1, delete "the signals" and insert --the low signals--.	Supplemental After Final Amendment dated November 5, 2004, page 5. See Attachment C.
Column 5, line 14, delete "6f" and insert --of--.	Supplemental After Final Amendment dated November 5, 2004, page 5. See Attachment C.
Column 6, line 67, after "base" delete "be".	Applicant error.

ERROR	APPLICATION FILE
Column 7, line 40, delete "4Q" and insert --40--.	Supplemental After Final Amendment dated November 5, 2004, page 7. See Attachment C.
Column 8, line 28, delete "fo" and insert --of--.	Applicant error.
Column 8, line 43, delete "the turn" and insert --then turn--.	Patent Application filed on January 16, 2001, page 19, line 1. See Attachment B.
Column 8, line 52, delete "TEMPERTURE" and insert --TEMPERATURE--.	Patent Application filed on January 16, 2001, page 19, line 7. See Attachment B.
Column 9, line 3, delete "(pH input" and insert --(pH input)--.	Patent Application filed on January 16, 2001, page 20, line 1. See Attachment B.
Column 9, line 35, delete "CALn." and insert --CALn--.	Patent Application filed on January 16, 2001, page 21, line 7. See Attachment B.
Column 9, line 55, delete "setting" and insert --setting.--.	Patent Application filed on January 16, 2001, page 22, line 3. See Attachment B.
Column 9, line 66, delete "Ln:xx" and insert --Hn:xx--.	Patent Application filed on January 16, 2001, page 22, line 11. See Attachment B.
Column 10, line 18, delete "th" and insert --the--.	Patent Application filed on January 16, 2001, page 23, line 6. See Attachment B.
Column 10, line 21, delete "use" and insert --user--.	Patent Application filed on January 16, 2001, page 23, line 8. See Attachment B.
Column 10, line 34, delete "Hn:Er" and insert --PH:Er--.	Patent Application filed on January 16, 2001, page 23, line 16. See Attachment B.

ERROR	APPLICATION FILE
Column 10, line 37, delete "he" and insert --the--.	Patent Application filed on January 16, 2001, page 23, line 18. See Attachment B.
Column 10, line 41, delete "marches" and insert --matches--.	Patent Application filed on January 16, 2001, page 23, line 21. See Attachment B.
Column 10, line 53, delete "if a" and insert --if the--.	Patent Application filed on January 16, 2001, page 24, line 10. See Attachment B.
Column 11, line 47, delete "is maintenance mode" and insert --is in maintenance mode--.	Applicant error.
Column 11, line 53, delete "re" and insert --are--.	Applicant error.
Column 12, line 9, delete "fog" and insert --from--.	Patent Application filed on January 16, 2001, page 27, line 17. See Attachment B.
Column 12, line 42, delete "a on/off" and insert --an on/off--.	Applicant error.
Column 12, line 43, delete "hey" and insert --they--.	Patent Application filed on January 16, 2001, page 28, line 20. See Attachment B.
Column 13, line 18, delete "or" and insert --for--.	Patent Application filed on January 16, 2001, page 30, line 12. See Attachment B.
Column 13, line 22, delete "dressed" and insert --pressed--.	Patent Application filed on January 16, 2001, page 30, line 16. See Attachment B.
Column 16, line 4, delete "Present" and insert --present--.	Supplemental After Final Amendment dated November 5, 2004, page 11. See Attachment C.

ERROR	APPLICATION FILE
Column 17, line 12, delete "trough" and insert --through--.	Patent Application filed on January 16, 2001, page 38, line 15. See Attachment B.
Column 17, line 13, delete "lag" and insert --flag--.	Patent Application filed on January 16, 2001, page 38, line 16. See Attachment B.
Column 17, line 43, delete "Th&up" and insert --The up--.	Patent Application filed on January 16, 2001, page 39, line 19. See Attachment B.
Column 19, line 19, delete ",are" and insert --the--.	Patent Application filed on January 16, 2001, page 43, line 13. See Attachment B.
Column 19, line 41, delete "or" and insert --for--.	Patent Application filed on January 16, 2001, page 44, line 7. See Attachment B.
Column 19, line 52, delete "here" and insert --there--.	Patent Application filed on January 16, 2001, page 44, line 14. See Attachment B.
Column 19, line 55, delete "heaving" and insert --heating--.	Patent Application filed on January 16, 2001, page 44, line 16. See Attachment B.
Column 19, line 64, delete "ox" and insert --of--.	Patent Application filed on January 16, 2001, page 45, line 3. See Attachment B.
Column 20, line 2, delete "scheduler" and insert --scheduled--.	Patent Application filed on January 16, 2001, page 45, line 6. See Attachment B.
Column 20, line 7, delete "educe" and insert --reduce--.	Patent Application filed on January 16, 2001, page 45, line 9. See Attachment B.

ERROR	APPLICATION FILE
Column 20, line 38, delete "sa" and insert --spa--.	Patent Application filed on January 16, 2001, page 46, line 12. See Attachment B.
Column 20, line 38, after "unattended" insert --.-- (a period).	Patent Application filed on January 16, 2001, page 46, line 12. See Attachment B.
Column 21, line 26, delete "convening" and insert --converting--.	Response dated September 14, 2004, page 3. See Attachment D.
Column 22, line 7, delete "Interconnection" and insert -- interconnection--.	Applicant error.

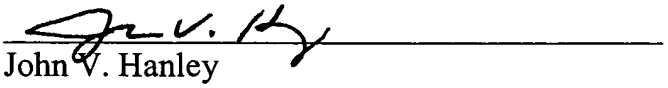
These errors occurred in good faith and correction thereof does not involve such changes in the patent as would constitute new matter or would require re-examination. It is requested that a Certificate of Correction be issued and returned to us.

Attached hereto, in duplicate, is Form PTO-1050, with at least one copy being suitable for printing.

A duplicate of this document is attached.

Respectfully submitted,

FULWIDER PATTON LLP

By: 

John V. Hanley
Registration No. 38,171

JVH:ck
Enclosures

Howard Hughes Center
6060 Center Drive, Tenth Floor

Los Angeles, CA 90045
Telephone: (310) 824-5555
Facsimile: (310) 824-9696
Customer No. 24201

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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,976,052 B2

APPLICATION NO.: 09/761,264

ISSUE DATE : December 13, 2005

INVENTOR(S) : Michael E. Tompkins et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title page, drawing should be deleted to appear as per the attached Fig. 1.

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Page 3, OTHER PUBLICATIONS,
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Line 14, delete "**6f**" and insert --of--.

MAILING ADDRESS OF SENDER:
John V. Hanley
Fulwider Patton LLP
6060 Center Drive, 10th Floor
Los Angeles, CA 90045

This collection of information is required by 37 CFR 1.322 and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing the burden, should be sent to the Chief of Information Officer, U.S. Patent and Trademark Office, U.S. Department. of Commerce, P.O. Box 1450 Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORM TO THIS ADDRESS. **SEND TO: Attention Certificate of Corrections Branch, Commissioner of Patents P.O. Box 1450 Alexandria, VA 22313-1450**

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Line 41, delete "marches" and insert --matches--.

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John V. Hanley
Fulwider Patton LLP
6060 Center Drive, 10th Floor
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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,976,052 B2

APPLICATION NO.: 09/761,264

ISSUE DATE : December 13, 2005

INVENTOR(S) : Michael E. Tompkins et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Line 53, delete "if a" and insert --if the--.

Column 11,
Line 47, delete "is maintenance mode" and insert --is in maintenance mode--.
Line 53, delete "re" and insert --are--.

Column 12,
Line 9, delete "fog" and insert --from--.
Line 42, delete "a on/off" and insert --an on/off--.
Line 43, delete "hey" and insert --they--.

Column 13,
Line 18, delete "or" and insert --for--.
Line 22, delete "dressed" and insert --pressed--.

Column 16,
Line 4, delete "Present" and insert --present--.

Column 17,
Line 12, delete "trough" and insert --through--.
Line 13, delete "lag" and insert --flag--.
Line 43, delete "Th&up" and insert --The up--.

MAILING ADDRESS OF SENDER:
John V. Hanley
Fulwider Patton LLP
6060 Center Drive, 10th Floor
Los Angeles, CA 90045

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It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 19,
Line 19, delete ",are" and insert --the--.
Line 41, delete "or" and insert --for--.
Line 52, delete "here" and insert --there--.
Line 55, delete "heaving" and insert --heating--.
Line 64, delete "ox" and insert --of--.

Column 20,
Line 2, delete "scheduler" and insert --scheduled--.
Line 7, delete "educe" and insert --reduce--.
Line 38, delete "sa" and insert --spa--.
Line 38, after "unattended" insert --.-- (a period).

Column 21,
Line 26, delete "convening" and insert --converting--.

Column 22,
Line 7, delete "Interconnection" and insert --interconnection--.

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Fulwider Patton LLP
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Los Angeles, CA 90045

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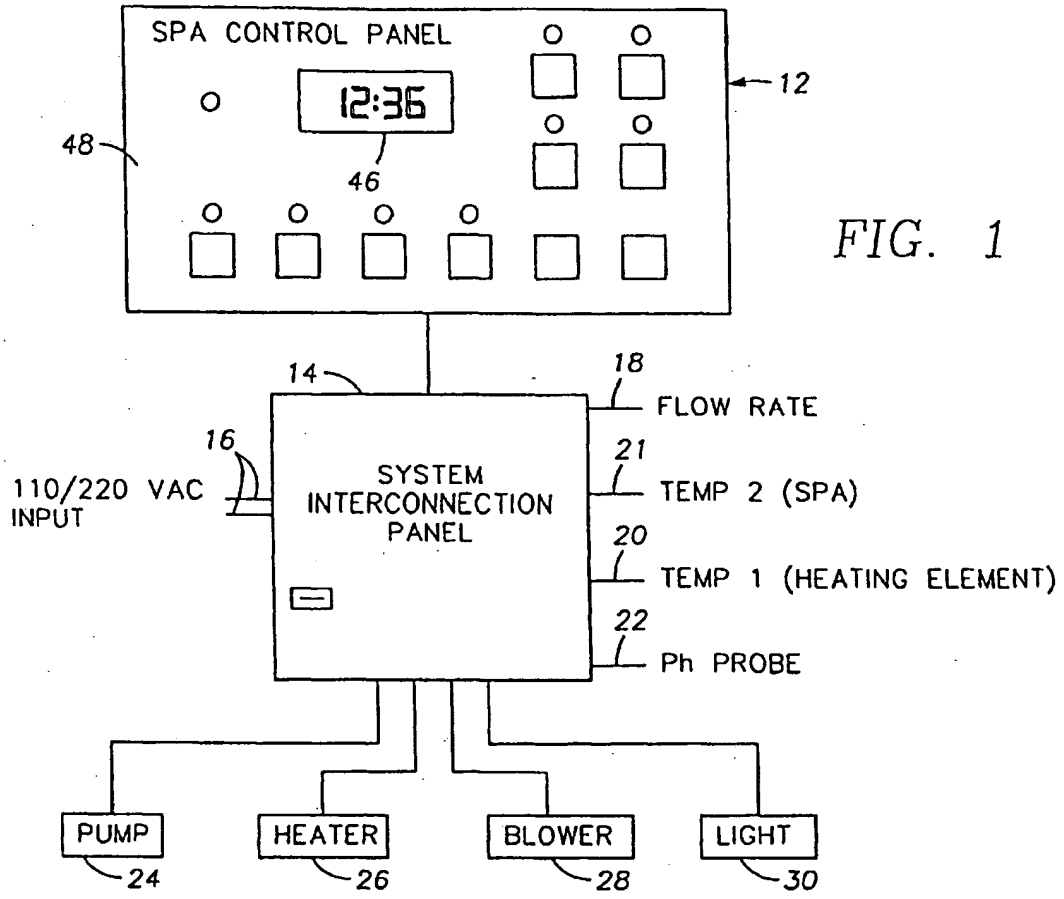

FIG. 1

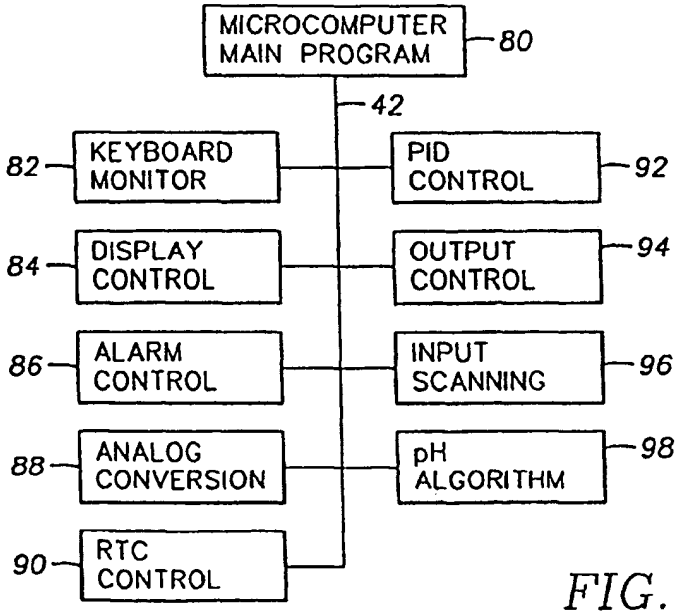

FIG. 4

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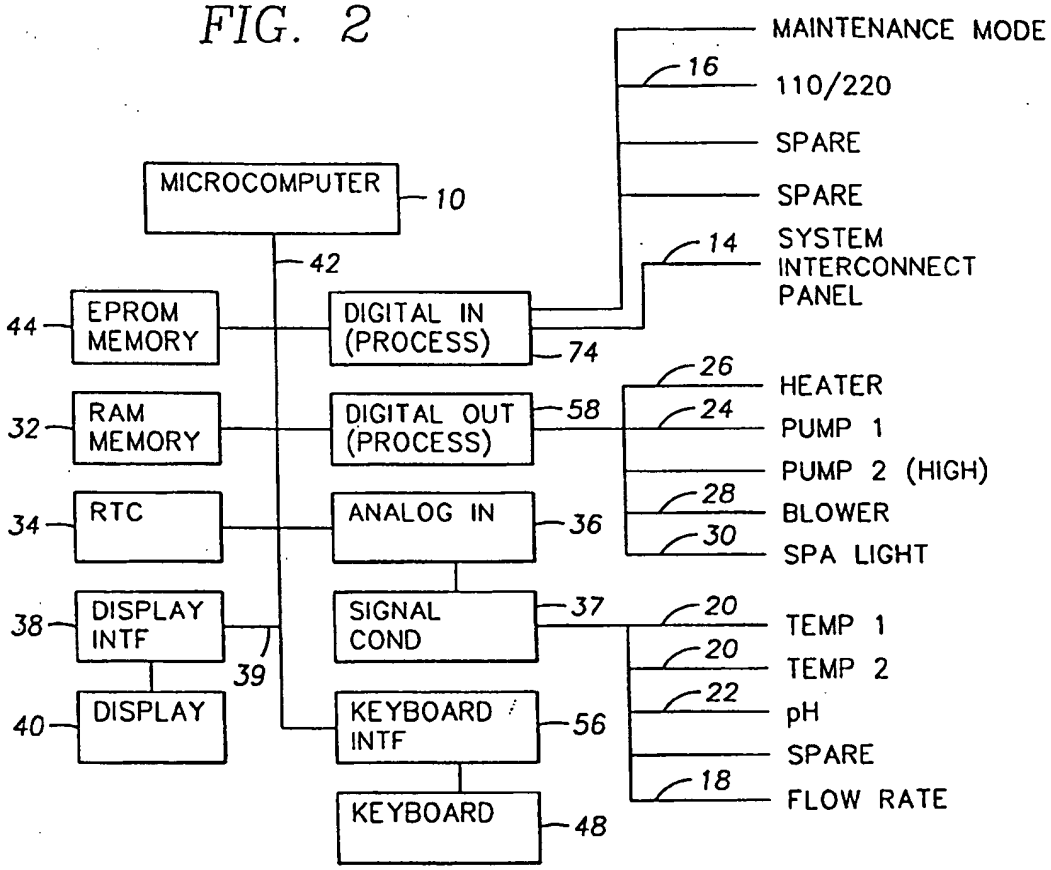
FIG. 2



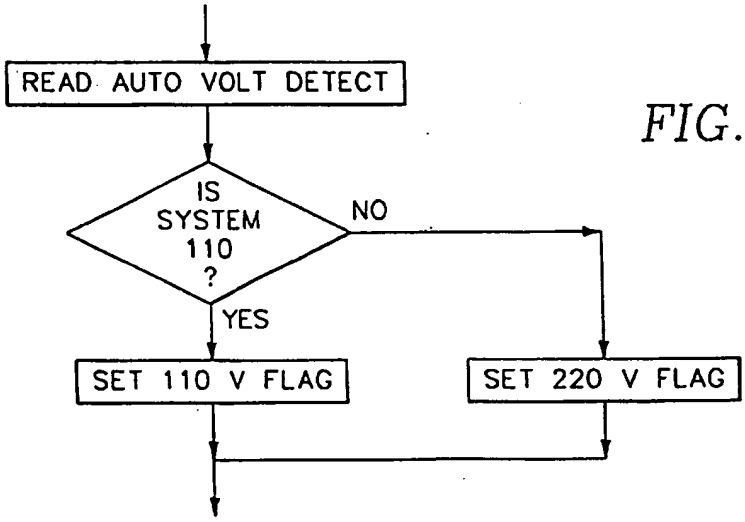


FIG. 8

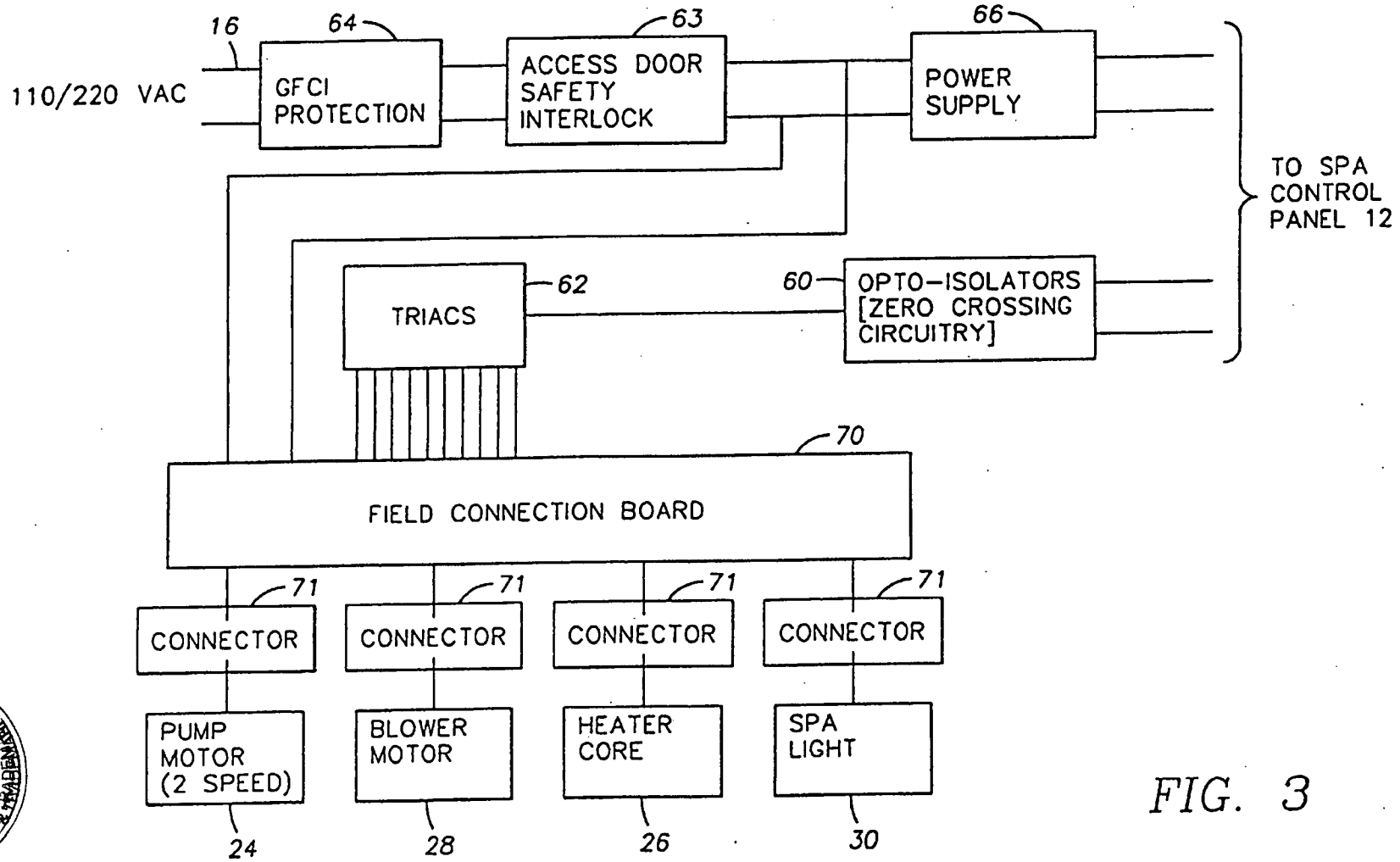


FIG. 3

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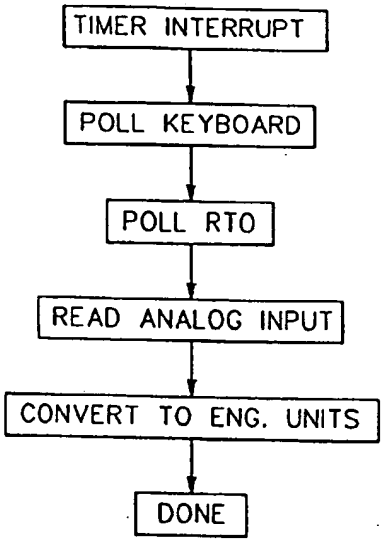

FIG. 12

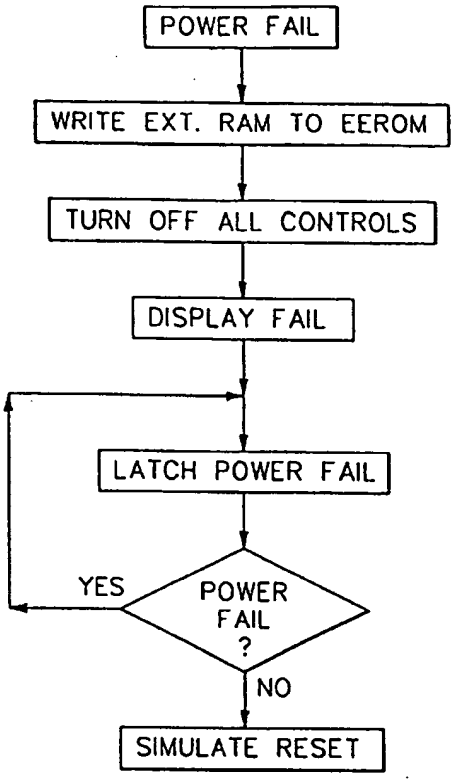

FIG. 13

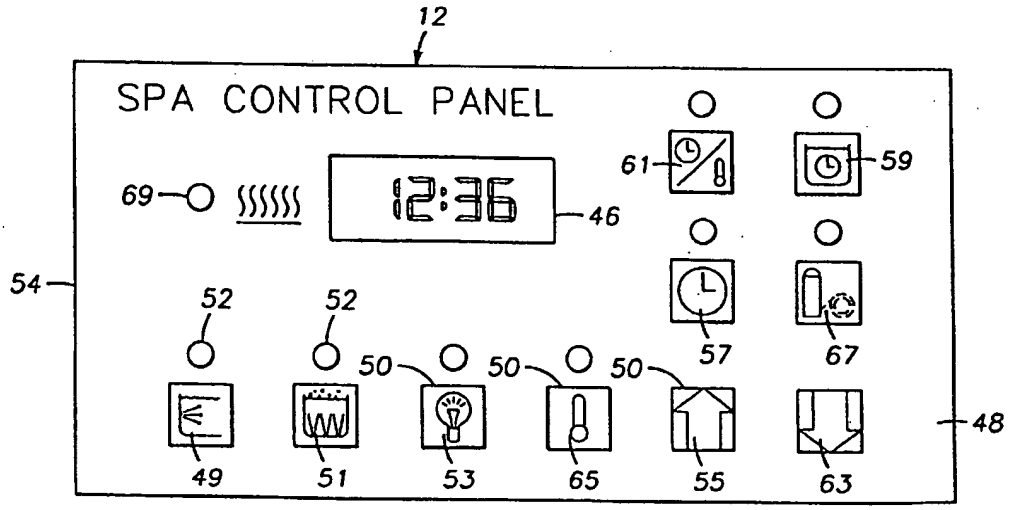

FIG. 5

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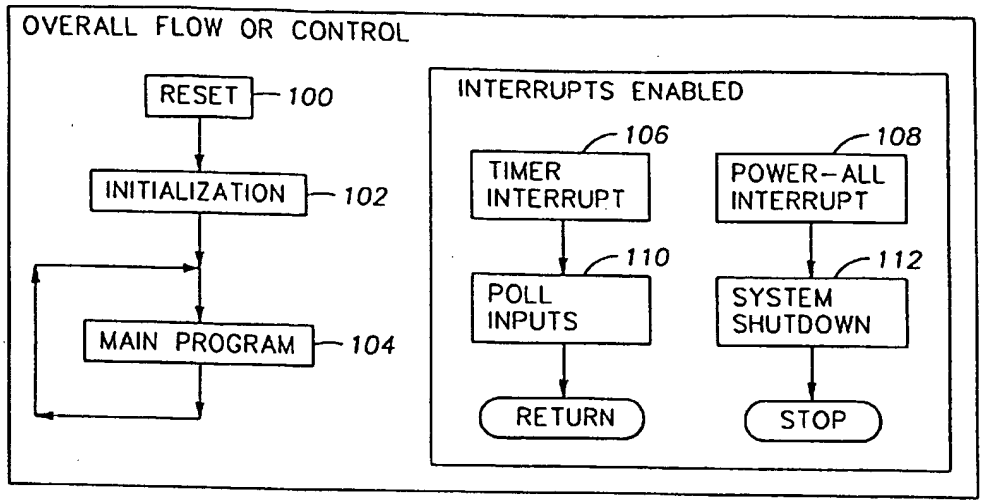

FIG. 6

$TEMP_F$ = DESIRED TEMPERATURE OF SPA WATER
$TEMP_1$ = TEMPERATURE AT FIRST SENSOR (S_1)
$TEMP_2$ = TEMPERATURE AT SECOND SENSOR (S_2)
$TEMP_\Delta$ = $TEMP_1 - TEMP_2$
Δ_L = LIMIT OF ACCEPTABLE TEMPERATURE DIFFERENCE (+ OR −)

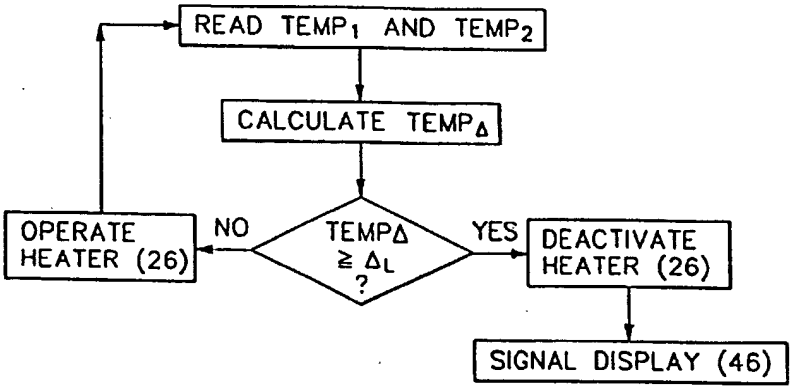

FIG. 7

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RATE = RATE OF HEATING
$RATE_{AV}$ = RATE OF HEATING (AVERAGE)
$TEMP_I$ = INITIAL TEMPERATURE OF SPA WATER
$TEMP_F$ = DESIRED TEMPERATURE OF SPA WATER
$TEMP_\Delta$ = $TEMP_F - TEMP_I$
$TIME_I$ = TIME (INITIAL)
$TIME_F$ = TIME (FINAL)
$TIME_\Delta$ = $TIME_F - TIME_I$

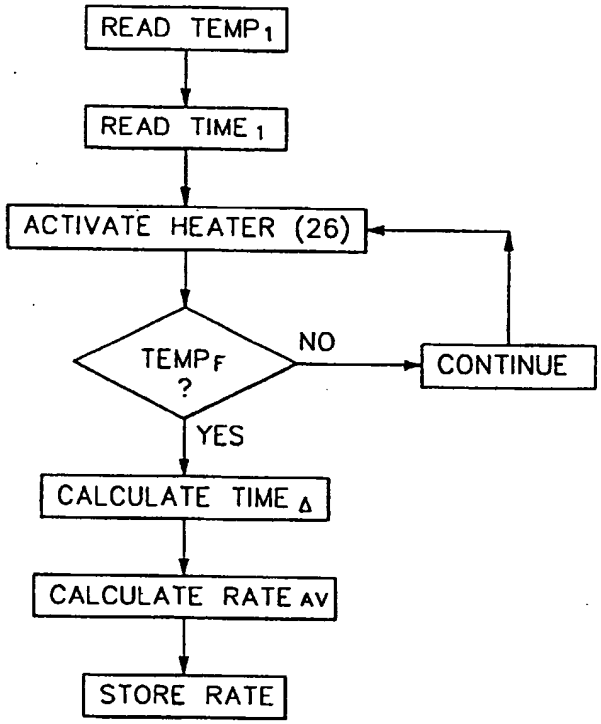

FIG. 9

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$TEMP_I$ = INITIAL TEMPERATURE OF SPA WATER
$TEMP_F$ = FINAL (DESIRED) TEMPERATURE OF SPA WATER
$TEMP_\Delta$ = $TEMP_F - TEMP_I$
RATE = RATE OF HEATING
$RATE_{AV}$ = RATE OF HEATING (AVERAGE)
$TIME_I$ = TIME (INITIAL)
$TIME_F$ = TIME (FINAL)
$TIME_\Delta$ = $TIME_F - TIME_I$

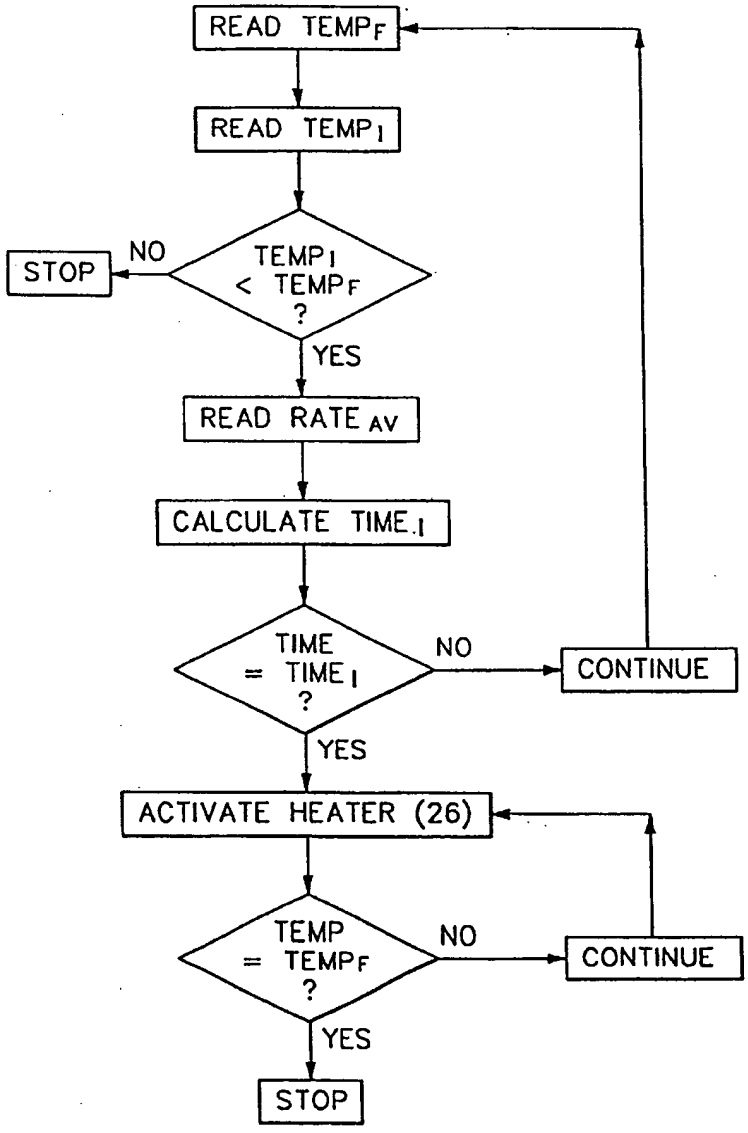

FIG. 10

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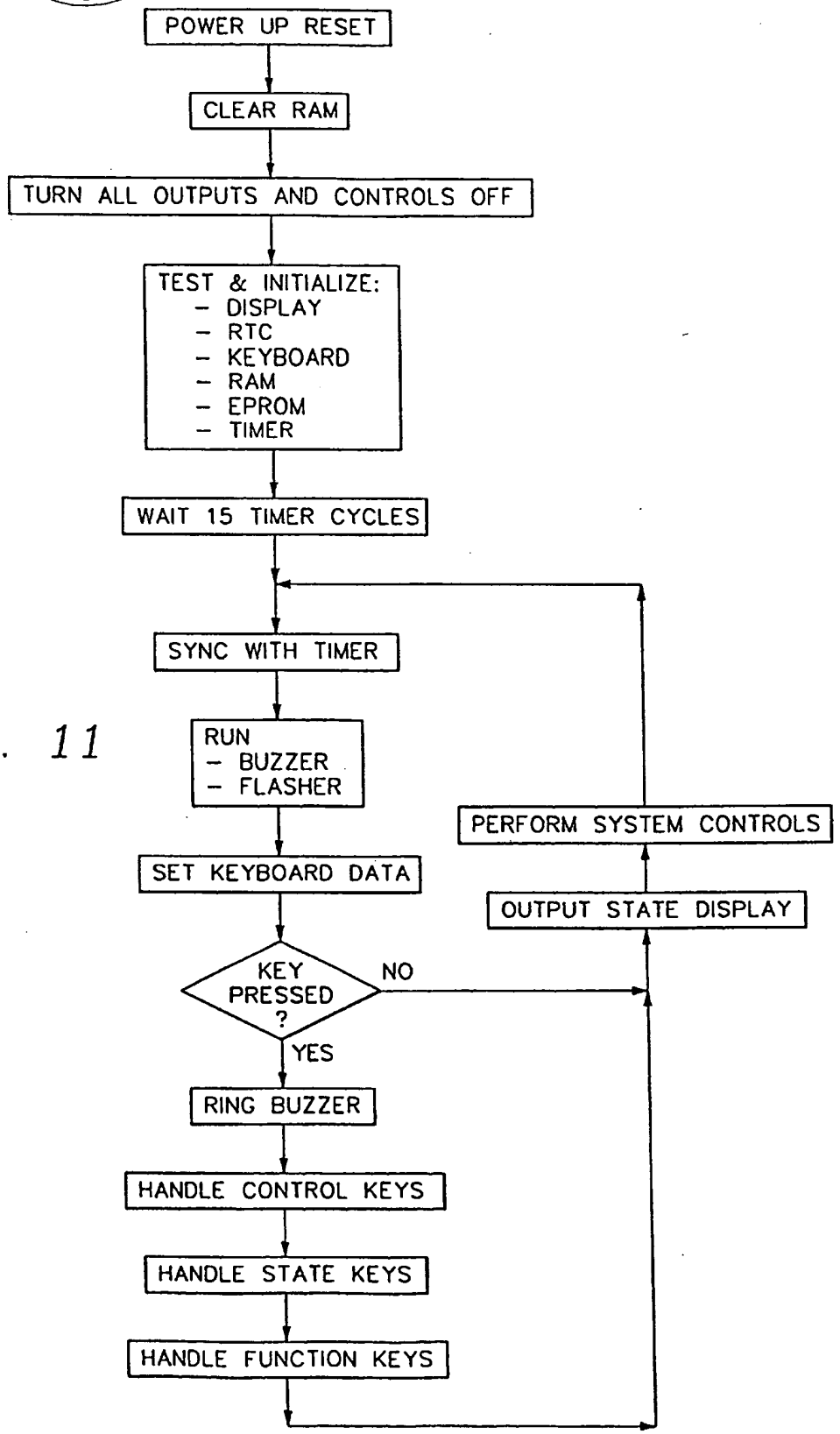

FIG. 11